

NEW ENGLAND NOTES

SOME NOTES REGARDING POLLINATION IN A NEW HAMPSHIRE POPULATION OF *PODOSTEMUM CERATOPHYLLUM* MICHX. (PODOSTEMACEAE)

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While working in the Hodgdon Herbarium, University of New Hampshire, I came across several specimens of *Podostemum ceratophyllum* Michx. (Riverweed or Threadfoot) which were collected in 1973 by the late Dr. Albion Hodgdon. Riverweed is a unique aquatic dicot found growing attached to rocks in rapidly moving water. In fact the entire family (Podostemaceae), primarily a tropical group, is ecologically restricted to rocks in the rapids of fast moving rivers and streams.

Noticing that these specimens had several flower buds but no open flowers I decided to visit the site at Packers Falls on the Lamprey River, Durham, New Hampshire, where Dr. Hodgdon had collected the plant, in hopes of finding flowering material. During my initial visit in early June I found the plants to be growing profusely, covering many rocks throughout the rapids. This first visit proved to be too early to obtain flowering material. Late in June I again visited the location and was delighted to find plants with small inconspicuous flowers in full bloom. Due to the lack of perianth parts the flowers are far from showy, but they proved to be very interesting with regard to their possible mode of pollination.

In tropical Podostemaceae, flowering occurs during the dry season after the water level in the river has dropped (Royen, 1951; Went, 1926; Accorsi, 1950; Willis, 1902). At this time the flowers open and are accessible for pollination. *Podostemum ceratophyllum* follows the trend of flowering when the water level subsides.

Anemophily and cleistogamy have both been reported for different species in this genus (Willis, 1902) and entomophily is common in the family (Went, 1926; Lawrence, 1951). The actual mode of pollination in *Podostemum ceratophyllum* is unclear, however. Hammond (1937) states that "since the flowers are not noticeably fragrant, and are somewhat inconspicuous, it seems likely that they are either anemophilous or autogamous". My observations during the summer

of 1980 shed some doubt on both pollination mechanisms suggested by Hammond.

It seems unlikely that anemophily could be successful when, at the time of anthesis, the flowers are no more than several centimeters above the water's surface, therefore being continually splashed and frequently inundated. Also, if anemophily (or even hydrophily) were taking place a much greater supply of pollen would be required to account for the large amount of waste involved in such a random pollination mechanism. In *Podostemum ceratophyllum* there are only two or three (occasionally four) anthers per flower. Relatively few flowers are open at any one time during the flowering period, further limiting a timely pollen supply. The flowers are not extrorsely exerted and lack feathery stigmas, features usually associated with anemophily.

Due to the lack of perianth, and no apparent nectaries, insect pollination seems unlikely. However, the dense mats of Riverweed are often inhabited by many types of aquatic insect larvae. Though I have not seen any of these insects visiting the flowers, more detailed observations and field experiments are required before entomophily can be completely ruled out.

Another problem regarding reproduction in this plant arose after I had sectioned numerous fruits, of all developmental stages, in the hopes of finding embryos. During this sectioning I was surprised to discover a complete lack of embryos. I also noticed a complete lack of embryosac development. These observations make pollination appear insignificant in this population. Hammond (1936) noted that *Podostemum ceratophyllum* has a great capacity for regeneration of vegetative organs after fragmentation. This vegetative growth most likely accounts for the majority of reproduction in this population. I have also sectioned seeds from other New England populations and have found embryos. From this, it appears that sexual reproduction is being inhibited in the Durham, New Hampshire location. Whether or not this inhibition is common in this species will be investigated during continued field work.

These observations illustrate the lack of understanding which exists concerning the reproductive biology of this interesting plant. Additional field observations throughout the range of the species will hopefully help to clarify some of these problems.

Riverweed is often overlooked because of its inconspicuous nature and the often inaccessible habitat in which it grows. Through

information from herbarium material I have become aware of several locations of this plant throughout New England and elsewhere. If anyone has any information regarding *Podostemum ceratophyllum*, or knows of any populations, I would be most pleased to hear of them.

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THE REDISCOVERY OF *JUNCUS STYGIUS* IN MAINE

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Juncus stygius L. var. *americanus* Buchenau is a northern bog rush found throughout Canada and rarely into northern United States from Maine to Minnesota. This rush is on the rare and endangered lists of Maine (Eastman, 1978), New York (Mitchell et al. 1980) and Michigan (Wagner et al., 1977). A total of five locations have been reported for this species from Minnesota (Wheeler & Glaser, 1979). Three historical records are known from Maine: two from Fort Kent and one from Crystal Bog, Crystal. The Fort Kent populations were last reported in 1908. The Crystal Bog population was discovered in